V.0 Technology Validation Sub-Program Overview

Introduction

The Technology Validation program element will install and operate, under real-world operating conditions, complete system solutions that will include all elements of hydrogen production and delivery infrastructure and vehicle systems. Novel new approaches such as distributed Power Parks, which integrate renewable and natural gas options and synergistically consider the transportation and electricity generation markets to improve the overall efficiency, will be installed and tested. Other concepts (energy stations) based on the co-production of electricity and hydrogen for vehicles will be investigated. The results of individual validations will be used to provide feedback on industry progress, information about what Hydrogen Program activities are being used by industry, and redirection as needed of the research and development program.

In 2004, the awards for the Hydrogen Fuel Cell Vehicle/Infrastructure Learning Demonstration were announced. The Learning Demonstration will be the first effort of its kind to bring together, at a national level, nearly every major automobile company and energy company to demonstrate hydrogen fuel and vehicles. The project will be a learning demonstration that will help DOE refocus its research and development efforts, provide insight into vehicle and infrastructure interface issues and help address codes, standards and safety issues. The project will develop complete system solutions, addressing hydrogen infrastructure and vehicle development in parallel to validate industry's progress toward a commercialization decision (scheduled for 2015).

Technology Status

The Learning Demonstration awards made in 2004 will begin to provide data in 2005 to allow the Technology Validation activity to begin comparing the status of fuel cell technologies relative to durability, vehicle driving range and production costs of hydrogen.

This past year, projects were completed related to infrastructure development, natural gas-to-hydrogen refueling stations, co-production of hydrogen and electricity, and renewable hydrogen production systems. The major accomplishments in these areas are listed below.

FY 2004 Accomplishments

Infrastructure:

- Completed 3 power park system designs and initiated equipment purchases (DTE, Arizona Public Service, State of Hawaii Department of Business, Economic Development, & Tourism)
- Regenerative back-up power system installed at a casino and business plan developed for telecommunication industry (Proton Energy)

Natural Gas-to-Hydrogen Refueling Stations:

- Based on Phase 2 subsystem development for the natural gas-to-hydrogen refueling station, a cost of $3.00/gge was projected to be achievable (Gas Technologies Institute)
- Completed approval process for hydrogen refueling system installation at LAX (Praxair)
- Integrated advanced compressor and reformer with existing transit company hydrogen production system in Palm Desert, CA (Hyradix/Sunline Transit)
- Initiated feasibility study/system design of advanced fluid compressor (Air Products and Chemicals, Inc.)

Co-Production of Hydrogen and Electricity:

- Preliminary tests completed; verified $3.60/gge hydrogen and 8¢/kWh electricity production (2003) (Air Products and Chemicals Inc.)
- Completed Phase 1 of high-temperature fuel-cell coproduction system study (documented station design for $1.50/gge hydrogen and 7¢/kWh electricity production by 2010) (Air Products and Chemicals Inc.)

Renewable Hydrogen Production Systems:

- Completed biomass pyrolysis system tests (Clark-Atlanta University)

FY 2005 Plans

In FY 2005, Technology Validation will be moving from individual projects to a more comprehensive national program which will evaluate fuel cell vehicles and associated infrastructure through the Learning Demonstration Project. The project is an important first step towards bringing energy companies and automakers together to solve all elements of infrastructure and vehicle development, supporting the President's Hydrogen Fuel Initiative in developing a path to a hydrogen economy. Important technology milestones that will indicate the likelihood of a commercialization decision by industry by 2015 include fuel cell durability of 2000 hours, vehicle range of 250 miles, and hydrogen fuel cost of $3/gge by 2009.

The funding portfolio for Technology Validation addresses the need to validate integrated hydrogen and fuel cell technologies for transportation, infrastructure, and electric generation in a systems context under real-world operating conditions. Compared to the FY 2004 appropriation of $15.6 million (in addition to $13 million in congressionally directed projects) for Technology Validation, the FY 2005 request is $32.9 million. The 2005 funding profile (subject to congressional appropriation) addresses key aspects of the Hydrogen Program mission, cross-cutting issues associated with the National Research Council Report, and system integration activities.